

How Digital Tools Can Reduce the Uncertainty in Online Beauty Product Purchases and Their Influence on Customers' Purchase Intentions

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Abstract:

Online beauty retail has almost always faced the challenge of purchase uncertainty, primarily about the high return rates and order cancellations. Although digital tools such as Augmented Reality (AR) and Artificial Intelligence (AI) have been considered as promising solutions, the mechanisms that mitigate online purchase uncertainty and enhance customers' purchase intentions require further investigation. This study has analyzed how AR and AI impact on customers' online purchase uncertainty and purchase intentions through literature reviews and a case study of Sephora's digital practices with the AIDA model. The result shows that AR reduces product-related uncertainty by reducing cognitive bias, creating a sense of presence, and mental imagery and AI reduces information-related uncertainty by mitigating information overload and ambiguity through personalized recommendations and forming perceived usefulness and perceived ease of use through AI chat bot. Trust is considered as a key moderator for the connection between uncertainty reduction and increased purchase intentions. These findings provide theoretical insights and practical suggestions for beauty brands in digital marketing.

Keywords: Online purchase uncertainty, Augmented reality (AR), Artificial intelligence (AI), Purchase intention, Beauty online retail.

1. Introduction

Online shopping has become one of the important channels for beauty product marketing. According to a beauty report, online beauty products' sales are

growing nine times faster than offline stores in the beauty industry, with a 21% increase in North America and a 20% increase in the Asia-Pacific area [1]. However, with the rapid growth of the online beauty industry market, a number of issues have gradually

occurred. On account of the inherent uncertainty of online beauty products' purchase caused by various factors, especially the characteristics that customers cannot touch or try, high return rates and even order cancellations are common problems on beauty e-commerce platforms [2]. Therefore, it is significant for the beauty industry to reduce this uncertainty and increase consumers' willingness to make purchase decisions.

Studies have indicated that there are two main types of online purchase uncertainty: product-related uncertainty and information-related uncertainty [3]. Furthermore, the development of digital tools provides novel methods for beauty brands to overcome these shortcomings of online marketing. Digital tools' applications especially Augmented Reality (AR) and Artificial Intelligence (AI) can effectively mitigate these two uncertainties and enhance consumers' purchase intentions by leveraging the moderator's role of trust mechanisms [4, 5]. What are the underlying principles behind how digital tools can reduce uncertainty and enhance purchase intensities through trust? How can these digital tools be used appropriately in a real business environment? The discussion of these questions is very meaningful for online beauty brands in developing digital marketing strategies and securing a place in the fierce business competition. This study will review and summarize existing literature and analyze a typical case of Sephora with the Attention-Interest-Desire-Action (AIDA) model to explore the relationship between the use of digital tools and the impact of online purchase uncertainty and consumer purchase intentions. Feasible solutions will be provided for beauty brands to optimize their online marketing digitalization strategies.

2. Explanation of Main Concepts

2.1 Key Digital Tools

Digital tools are widely used in current marketing place, providing new approaches and ideas for digital marketing. There are two key digital tools this article will mainly focus on: Augmented Reality (AR) and Artificial Intelligence (AI).

AR is an innovative technology that allows customers to experience the combination of virtual content with consumers' real-world scenarios. As a result, it greatly changes the way people experience and assess products before making a purchase decision. Specifically, AR can overlay virtual content onto a real-world background, making it easy for customers to perceive the virtual content as more believable and convey goodwill and trust in brand products to customers. Moreover, AR is usually integrated with various marketing touchpoints, such as interactive advertisements. This integration allows brands to effectively engage consumers at key stages of the purchase journey [6].

AI is an intelligent model that allows computer algorithms to mimic and perform like human beings through Machine Learning (ML), Large Language Model (LLM) and so on. In addition, generative AI is more powerful. Texts and images can be generated based on its database [7]. It is because of these characteristics that AI possesses great marketing capabilities, ranging from personal recommendation, AI chat bot, to content generation.

2.2 Uncertainty in Online Product Purchases

Uncertainty in online product purchases refers to consumers' inability to fully evaluate products before purchase, arising from multiple perspectives, including information asymmetry between buyers and sellers, as well as the inherent limitations of the online shopping environment [3]. In digital marketing, especially in e-commerce, the uncertainty is mainly presented by a high return rate. Moreover, the high return rates and even order cancellations have become the norm in beauty online retail, which better demonstrates the phenomenon of uncertainty [2]. There are multiple reasons behind this uncertainty. One possible reason is that the return behavior is caused by cognitive bias. For instance, when consumers find that the lipstick shade they bought online does not match their expectations from seeing the product introduction online, the gap between expectation and reality can lead to cognitive bias [2]. Adverse effects can be brought to the brand on account of uncertainty. Specifically, unsolved purchase uncertainty may reduce customers' trust towards the brand and its products, decreasing their willingness to make a purchase decision, as trust is widely recognized as a critical factor of purchase intention in e-commerce contexts [4]. Furthermore, the brand's economic benefits and long-term development can also be negatively affected. However, although it is difficult to completely eliminate uncertainty in e-commerce of digital marketing, study has indicated that new digital technologies are able to mitigate the uncertainty of online purchasing and reduce brand loss to some extent [8].

3. Literature Review

3.1 Sources of Online Purchase Uncertainty

The online purchase uncertainty is mainly reflected in two types, product-related uncertainty and information-related uncertainty.

3.1.1 Product-related uncertainty

Effect ambiguity describes a situation where consumers cannot accurately judge whether a product will deliver the desired outcomes under their own specific conditions. As a key aspect of product-related uncertainty, this problem is particularly obvious in the beauty industry. The effective-

ness of cosmetics is related to the customers' own conditions, such as skin tone and skin type. However, the online purchase process of beauty products lacks the conditions for direct trial use, which is one of the most important factors in making purchase decisions for consumers for beauty products, especially for skincare and makeup products. This kind of performance uncertainty allows customers to perceive the risks associated with product performance, which can affect future usage. Although price premium can occur under the product-related uncertainty, which seems to be a good thing for sellers, customers often hesitate to pay due to high purchase risks [3]. Besides, it is also a performance of cognitive bias [2]. It means that even if the product quality matches the price, this uncertainty will lead customers to delay order or return.

3.1.2 Information-related uncertainty

The information uncertainty is another reason for the online purchase uncertainty. Information description ambiguity, subjectivity in commentary, and information overload explain the information-related uncertainty. Firstly, it can be indicated by the uncertainty of the product description. Sellers' neglect or deliberate concealment of product defects can result in this issue [3]. Furthermore, customers are more easily influenced by other users' comments when making purchase decisions. However, product reviews can be shaped by personal preference, which means it may not accurately reflect the views of the broader consumer base [9]. Therefore, information-related uncertainty arises when customers' final product experience differs from reviews and leads to product return. Additionally, excessive information can overwhelm customers and distract them with irrelevant information sometimes, leading to low decision-making efficiency [3].

3.2 Ways of Digital Tools Mitigating Uncertainty & Purchase Intention

3.2.1 AR addressing product-related uncertainty

AR addressing product-related uncertainty starts with effect uncertainty, primarily focusing on three perspectives, cognitive bias reduction, sense of presence creation and mental imagery formation.

Firstly, by integrating virtual content with real-world environments, AR allows customers to believe in the realism of the effects. With the perceptible product information and effects, such as virtual makeup try-on, it helps consumers form more accurate expectations of product performance before making a purchase [5]. The novel and comfortable purchasing decision environment enables customers to choose beauty products that better match their own skin types through fully utilizing AR technology. Therefore, the online purchase uncertainty caused by cognitive bias can be effectively controlled.

Additionally, studies have suggested that AR creates a sense of presence, which, in simple words refers to creating the feeling of trying on makeup in person [5]. Specifically, because of customers' increased sense of behavior control through the form of combining virtual product with physical environment, customers' perceived purchase recognition can be decreased. Therefore, product-related uncertainty can be moderated simultaneously.

The study also demonstrates that this combination can lead to mental imagery, which is a cognitive process engaging multiple senses. There is a positive relationship between mental imagery and product uncertainty reduction. However, the significance of this relationship is moderated by the requirement of a sense of richness. A richer sense is needed when customers make purchase decisions. This positive correlation is more significant [10]. Beauty product's selection processes almost always require engaging multiple senses for customers. It means that AR technology is effective in reducing product uncertainty through the formation of mental imagery in the beauty industry.

3.2.2 AI addressing information-related uncertainty

Two vital applications of AI marketing, which are the AI recommendation system and AI chat bot exert a significant influence on the reduction of information-related uncertainty.

AI recommendation system, providing personalized purchase information to customers, reduces the information-related uncertainty mainly reflected in the recommendation accuracy and system personalization. This personalization relies on both explicit user feedback and analyzing implicit behavioral data such as page dwell time, click-through rate, and browsing history. These data allow the system to build a more comprehensive users' preference profile. Studies have indicated that the AI recommendation system, adapting to user characteristics can effectively improve the accuracy of information and system personalization, which lowers purchase uncertainty [11]. Specifically, such systems address two key sources of information uncertainty: information description ambiguity and information overload. Firstly, information description arises when a product introduction contains insufficient details. The AI recommendation system eliminates this issue through analyzing multiple data sources and finding the most suitable products. While subjective user reviews still pose challenges that AI recommendation system cannot fully address, such systems can greatly alleviate information overload through intelligent filtering and personalized content ranking. By highlighting the most relevant product information and user reviews, this approach eases the cognitive burden on consumers during decision-making.

The AI chat bot is another helpful application to work with information-related uncertainty through mechanisms

of perceived usefulness and perceived ease of use. Based on the Technology Acceptance Model (TAM), perceived usefulness describes the extent to which users believe that using this system can help them achieve their goals, while perceived ease of use reflects how easy users find a system to operate [12]. In the context of AI chatbots, stronger performance on these two dimensions tends to encourage more active consumer engagement. It can help them make more informed purchasing decisions and reduce information uncertainty. By using huge databases and LLM, high-quality and accurate information can be timely and effectively delivered to customers through AI chat bot, which can reduce ambiguity and uncertainty in online shopping. Furthermore, the reduction of uncertainty is related to psychological factors. The study has also stated that AI chat bot users nearly always have high emotional involvement and tend to perceive AI chat bot as friends or mentors, which can reduce customers' doubt about the information accuracy [13]. It further shows that information-related uncertainty can decrease when customers have more confidence in the content provided.

3.2.3 Impact on purchase intention through the mediating role of trust

Both product-related uncertainty and information-related uncertainty have a negative relationship with customers' purchase intention [9]. It suggests that customers' purchase intention can be improved when digital tools reduce online purchase uncertainty. At the same time, trust plays a mediating role in this relationship.

Both the AI recommendation system and AI chat bot can improve customers' trust to a certain degree after decreasing purchase uncertainty [11, 13]. In addition, research has also proved that there is a positive relationship between customer trust and purchase intention [4]. It is worth noticing that although the samples of the study in 2022 are geographically concentrated, which leads to the limitations of the study, a large sample size of 560 from various industries are chosen, which also demonstrates samples' relatively low inaccuracy and high randomness as well as high credibility of the conclusion. Consequently, it implies that trust built after a decrease in uncertainty can enhance customer's purchase intention in e-commerce of digital marketing.

4. Case Study of Sephora

4.1 Brand Introduction

Sephora is a global prestige beauty brand, combining re-

tail, digital platform, and beauty community. With diversity and inclusivity as its core business value, the company serves customers who boldly pursue beauty regardless of age and race. Sephora's other brand value is to promote digitalization and innovation [14]. Sephora is devoted to seeking new market opportunities through the innovative usages of digital marketing strategies. Artificial Intelligent (AI) and Augmented Reality (AR) are integrated into its digital transformation process, which allows Sephora to stand out under the fierce marketing competition in the digital era, and effectively address the uncertainties faced by beauty brands in the e-commerce sector. This section applies the AIDA model as an analytical framework to examine Sephora's digital marketing practices and to offer empirical support for the findings established in the literature review.

4.2 Usage of Digital Tools in Online Marketing & Analysis with Business Model

The applications of AR are mainly reflected in two key virtual try-ons, virtual artists and skincare matching. Virtual artists are a visible tool, combining AR and AI algorithms. By capturing customers' facial features, virtual cosmetics can be overlaid on faces. After identifying different skin tones, virtual step-by-step tutorials costumed to their own faces are also provided. It allows online customers to experience the product's markup effect intuitively. The function of skincare matching is familiar to virtual artists but focuses on skincare products. By scanning customers' faces with a phone and analysing the nature of skin, more suitable skincare products can be provided to customers. Sephora's personal recommendation and AI chatbot are presentations of the innovative usages of AI tools. After gathering extensive data on user behaviors, such as the browsing history and click-through rate, Sephora's AI system uses collaborative filtering and content-based filtering algorithms to process large amounts of behavioral data to generate personalized purchasing purchase recommendations that match individual customers' preferences. In addition, AI chatbot can support user inquiries about products, provide timely and more precise responses [15].

The AIDA model, including four steps, attention, interest, desire, and action, describes the stages of a consumer's psychological process from exposure to marketing information to making a purchase decision.

Table 1. AIDA Model Analysis of Sephora's Digital Tools' Usages

AIDA Stages	Digital Tools	Mitigating Uncertainty	Theoretical Mechanism
Attention	AR-Virtual Artist	Information-related Uncertainty	Innovative Formats Reducing Cognitive Burden
Interest	AI Recommendation System	Information-related Uncertainty	Reduce Cognitive Burden: Information Description Ambiguity Information Overload
Desire	AR-Virtual Artist & AR-Skincare Matching	Product-related Uncertainty	Reduce Cognitive Bias Create a Sense of Presence Form Mental Imagery
Action	AI Chat Bot	Information-related Uncertainty	Perceived Usefulness Perceived Ease of Use

Table 1 shows how Sephora uses AR and AI to mitigate uncertainty in the online shopping process drawing on scientific theories.

Although AR is more effective in reducing product-related uncertainty, it can also significantly mitigate information-related uncertainty during the attention stage. When consumers first encounter the brand or its products, they often face the challenges of information overload [3]. Virtual artists of AR technology allow customers to try cosmetics virtually in real time, creating an immersive and interactive experience. It can reduce cognitive load, and help consumers manage information overload through sensory-based product evaluation. As an innovative shopping approach, it easily attracts users' attention when promoted on social media and Sephora's brand platform. Moreover, its intuitive visual effects and novel features help customers quickly focus on their interested products, reducing the cognitive burden of blindly searching through a great amount of information. With less time and effort required to understand the brand and its products, customers become more engaged and willing to explore further.

After entering the interest stage, customers start to actively look for product information to support their decision-making. However, there are much information, including some vague and repetitive descriptions. The AI recommendation system helps reduce the information-related uncertainty that comes with too much information. Sephora's AI personal recommendation system can provide high-related and personalized information based on browsing history, search keywords, and browsing time. Therefore, it can manage information overload by presenting the most related descriptions. What's more, the precision of product recommendations can be improved by analyzing product characteristics using algorithms and combining them with consumer preferences. Studies have stated that personalized and highly relevant content can effectively enhance customers' interest in the brand and their willingness to move into the desire stage [16].

The desire stage is crucial for building customers' trust. It requires the brand to offer a more customized and personalized shopping experience [16]. Sephora aims to reduce the product-uncertainty and build trust with customers through virtual artists and skincare matching. Firstly, AR virtual artists' cosmetic try-ons and skin matching's analysis, can control customers' cognitive bias. As products' difference between its description and reality can be easily seen, it allows customers to better assess whether the products fit their expectations. Furthermore, the combination of virtual cosmetics and physical environment creates a sense of presence [5]. This process can stimulate consumers' visual senses, and this vivid mental imagery helps reduce perceived uncertainty. Moreover, both virtual artists and skin matching can provide personalized product recommendations and customized makeup tutorials. These functions with strong interaction can transform customers' uncertainty about the product into trust in product effectiveness and the brand of Sephora.

In the action stage, the last part of the AIDA model, this is where customers' purchase intentions need to turn into a real purchase. Studies have shown that simplified operations can facilitate this process [16]. AI chat bot has similar characteristics, mitigating uncertainty and building trust. On the one hand, in terms of perceived usefulness, LLMs enable the delivery of real-time, accurate product information, helping customers quickly address pre-purchase inquiries. On the other hand, as for perceived ease of use, AI chat bot can mimic the natural tone of salesperson. Therefore, the friendly attitude can bridge the gap between each other and allows customers to treat Sephora's AI chat bot as a real beauty consultant. It can easily build trust between customer and brand, enhancing purchase intention and ultimately leading to purchase decision.

4.3 Summary

The appropriate usages of AR and AI has decreased the online purchase uncertainty, built customer trust, and increased their purchase intentions. According to DigitalDefynd (2026), customers who use the virtual artists and the skincare matching are three times more likely to make purchase decisions than those who do not use the tools [17]. Personal recommendations make the average order value has increased by 25% and the number of repeat customers has increased by 17%. Cart abandonment has decreased by 18%, while customer service operational costs have dropped by 20% [17]. It demonstrates the great benefits brought to Sephora on account of the digital tools' applications in its online beauty retail.

5. Discussion and Suggestion

5.1 Overall Findings of the Study

This study concludes that digital tools, AR and AI can effectively reduce online purchase uncertainty. In particular, AR addresses product-related uncertainty by reducing cognitive bias, creating a sense of presence and mental imagery. AI is more effective at managing information-related uncertainty. By providing personalized recommendations and accurate responses, it can mitigate information ambiguity and information overload. Analysis through the AIDA model framework reveals that trust is a significant mediator across the four stages: attention, interest, desire and action. As consumers interact with AR and AI, trust gradually builds and accumulates. The development of trust also indicates the increase in customers' purchase intentions. Ultimately, these purchase intentions can be translated into the final purchase decisions.

5.2 Limitations

Although digital tool applications can help beauty brands address the online purchase uncertainty and build trust with customers, it is important to note that such personalized value is not unconditional. It emphasizes the boundary of data privacy. Research has suggested that although customers prefer tailored shopping experience, they also worry about the misuse of personal information. Moreover, this fear, especially the feeling of being monitored and the lack of transparency in algorithms might decrease the trust towards the products and brands [18]. This finding suggests that beauty brands should seek to balance digital innovation with data management by following privacy-by-design principles. It allows customers to be clearly informed of how their personal data is collected, used, and protected.

In addition, while Sephora's case shows the strong market performance of digital tools applications, it is important to

recognize that developing and refining these digital tools require enough time and financial support. In the short run, brands without adequate financial and technological infrastructure might feel difficult to apply these digital tools immediately. During this transition process, the beauty industry can consider adjusting its return policy in the short term to maintain customer trust and reduce potential economic losses [2]. Furthermore, this study assumes that companies have the financial and technological abilities to use digital tools in marketing, such as Sephora. However, the effectiveness of such tools for small and medium enterprises (SMEs) with small operating scales remains an important area for future research.

6. Conclusion

This study explores the underlying principles how AR and AI can reduce online purchase uncertainty and increase customers' purchase intentions in the beauty industry. Through literature reviews and Sephora's case study analyzing with the AIDA model, the study ultimately concludes that AR effectively mitigates product-related uncertainty through three key mechanisms: reducing cognitive bias, fostering a sense of presence, and facilitating mental imagery. AI focuses more on addressing information-related uncertainty. Specifically, AI recommendation system reduces information description ambiguity and information overload, while AI chat bot manages this kind of uncertainty by enhancing perceived usefulness and perceived ease of use. Trust act as a key moderator. It transforms online purchase uncertainty into increased purchase intentions, extending to the AIDA model's four steps: attention, interest, desire, and action. Based on these findings, the study suggests that beauty brands should integrate AR and AI tools in their digital marketing strategies, while paying attention to digital privacy and financial and technological limitations faced by SMEs. These results offer deep insights into how digital transformation can enhance customers' purchase confidence. Practical guidance for beauty brands to optimize their online purchase strategies in the fierce e-commerce competition of the beauty industry is also provided.

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